

resolve the infertility associated with hyperprolactinemia. The ease of establishing the diagnosis by the readily available immunoassay of serum prolactin clearly opens a new and satisfying vista for the treatment of the amenorrhea/galactorrhea syndrome.

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## Deep Brain Electrical Stimulation to Control Intractable Pain

INTRACTABLE PAIN presents as a clinical problem across the spectrum of clinical medical disciplines. Chronic pain of both malignant and nonmalignant causes results in disability, suffering and hardship for thousands of people every year. Recent developments have indicated that chronic pain might be controlled by electrical stimulation of an antinociceptive system which is located, in part, at the paramidline structures in close relation to the back of the 3rd ventricle and the aqueduct of Sylvius.

Investigators have produced profound analgesia in laboratory animals by electrical stimulation at the above deep brain locations. Moreover, investigators have shown that the same locations have stereospecific morphine receptor sites which are productive of analgesia with microinjections of

opiates. An important link in this system was the discovery of enkephalins, opiate-like polypeptides which are produced endogenously. Possibly, it is speculated, electrical stimulation of deep brain structures releases enkephalins, thereby producing analgesia.

The first reports of deep electrode implantation in groups of patients with intractable pain have been favorable (75 percent to 80 percent of the patients have complete or satisfactory relief of pain) for the follow-up period (up to three years). It is now thought that electrical stimulation of the paramidline structures activates a serotonergic descending dorsal lateral spinal pathway to inhibit spinal nociceptive neurons either directly or by the release of enkephalins. The addition of L-tryptophan, a serotonin precursor, in high doses to patients' diet may improve the efficacy of deep brain stimulation for the treatment of chronic pain.

Deep electrode stimulation for the treatment of chronic pain is a promising new therapeutic technique for an old and frustrating problem. It is the clinical application of a technique founded on the basis of a large body of preliminary investigative development.

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